

NASA Science Mission Directorate - Applied Sciences Program

Ecological Forecasting – Fiscal Year 2005 Annual Report *



SUMMARY

The Ecological Forecasting Program was very active in FY 2005. The President of Panama inaugurated the primary node for SERVIR, which is the program's signature decision support system to which it extends NASA Earth science research results. The program completed an evaluation report for the *Vista Decision Support System* and an evaluation report for the *Terrestrial Observation and Prediction System (TOPS)*. The program convened or participated in four workshops.

MAJOR ACCOMPLISHMENTS

Regional Visualization and Monitoring System (SERVIR)

In February 2005, the President of Panama inaugurated the SERVIR primary node in the Water Center for the Humid Tropics of Latin America and the Caribbean (CATHALAC) facility in the City of Knowledge, Republic of Panama. SERVIR supports generation of operational decision support products, including those for fires, red tides (aka, harmful algal blooms), short-term numerical weather forecasts (utilizing the Weather Research and Forecast model (WRF)), hurricane tracking, and rainfall. At the end of FY05 (and continuing into FY06), the SERVIR leadership began drafting a SERVIR Project Plan and a SERVIR Verification, Validation and Benchmark Report. The CATHALAC Director Emilio Sempris serves as a reviewer for the IPCC Fourth Assessment Report (Working Group II on Vulnerability and Adaptation). <http://servir.nsstc.nasa.gov/home.html>

Note: Following the October eruption of El Salvador's Santa Ana volcano and October arrivals of Hurricanes Stan and Wilma, the program's SERVIR team was especially active and tirelessly dedicated to provide Central American emergency managers with land cover and flooding information to support their recovery efforts.

REASoN: NatureServe Vista Decision Support System Supported U.S. Forest Service Forest Planning

The NatureServe *Vista* decision support tool is designed to help planners, conservation groups, and local communities to better integrate biodiversity information into their land-use and conservation planning processes. NASA, through the REASoN CAN, supports NatureServe's integration of NASA Earth science research results into *Vista*, thereby extending those products broadly. The U.S. Forest Service (USFS) Bridger-Teton National Forest (BTNF) is a partner for this REASoN project.

In FY05, NatureServe released *Vista* Version 1.0, and BTNF subsequently installed it. NatureServe conducted a scoping workshop with BTNF, resulting in a crosswalk of forest planning requirements to current *Vista* capabilities and prioritization of new capabilities for *Vista* version 2.0. In September, NatureServe completed *Vista* 1.3 (beta version) and initiated prototyping work for functions that will calculate indices of landscape integrity and integration of aquatic biodiversity components for *Vista* version 2.0.

The project team also completed an evaluation report of *Vista* in June 2005 and established a project collaboration website on the USGS National Biological Information Infrastructure (NBII) website to

* The FY05-09 Ecological Forecasting Program Element Plan is available through: <http://aiwg.gsfc.nasa.gov/dss.html>

facilitate discussions and review of documents. The team conducted three methodology prototyping workshops and one additional workshop with the USFS research officer in charge of ecological management software to determine potential linkages with *Vista*. <http://www.nbii.gov>

Terrestrial Observation and Prediction System (TOPS)

The TOPS team continued to build its partnership with the U.S. National Park Service (NPS), creating a suite of prototype data products for use by NPS staff in Yosemite National Park. The team completed an Evaluation Report and developed a project plan for its work with NPS. (TOPS is a modeling software system that brings together technologies in information technology, weather/climate forecasting, ecosystem modeling, and satellite remote sensing to enhance management decisions.)

In FY05, TOPS distributed an average of over 210 GB of data each month, reaching as many as 21 different users in any given month. Over the course of the year, the time necessary to fulfill a request decreased from an average of 14 days to just 3-5 days. The team made significant improvements to the TOPS Planner. Improvements included integration with another TOPS tool to provide easier incorporation of MODIS datasets, combination of *Terra* and *Aqua* MODIS datasets to provide the least cloudy data for a specific region, and improved performance. Additional improvements to TOPS included a database system redesign to provide better access to a larger subset of metadata and improve database scalability; automation of the climate gridding subsystem and addition of new data sources; improvement in the DAAC interfaces; and completion of a prototype system to use direct broadcast data from *Terra* and *Aqua*.

NASA-NGO Working Group Project Supporting Biodiversity Indicators

In FY05, this Ecological Forecasting group worked to develop a Sourcebook for Remote Sensing for Biodiversity Indicators. The final version of the Sourcebook will be published by the United Nations Environment Programme (UNEP) and the Secretariat of the United Nations Convention on Biological Diversity (CBD). (Note: This work responds to biodiversity tasks in the Group on Earth Observation (GEO) 2006 work plan.)

Over the past year, the group has provided direct support to the CBD Secretariat for a variety of issues, including: participation at the *Tenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice* in Bangkok, Thailand; participation in the *Ad Hoc Open-ended Working Group on the Review of Implementation of the Convention* in Montreal, Canada; and, review and commentary on the upcoming *Global Biodiversity Outlook*.

Protected Area Archive

The Ecological Forecasting program (through JPL) completed and launched Version 1.0 of the Protected Area Archive (PAA) Viewer/Toolkit at the November 2004 World Conservation Union (IUCN) World Conservation Congress in Bangkok, Thailand. In July 2005, the World Bank Development Grant Facility provided funding for a pilot of Version 2.0, and an Indian conservation nongovernmental organization began development. The project team also secured funding for the post-pilot phase, and the team has created PAA collections for more than a dozen countries, including all the countries in Central America.

The project team received funding from The Nature Conservancy and the U.S. Department of State to enhance the Archive's "Collection Generator." With the State Department funding, the team will add the ability to utilize IKONOS imagery and to generate a collection of tsunami images, enabling an enhanced response to future disasters. The USGS EROS Data Center is reviewing the PAA for incorporation into its data services offerings.

Congo Basin Forest Monitoring for USAID's Central African Regional Program for the Environment (CARPE)

The Ecological Forecasting team played a key role in producing an assessment of the forests of the Congo Basin. Project partners at the University of Maryland chaired the assessment's editorial board, contributed material, and supported the logistics to ensure the report was ready for the *Second Summit on Forests for Heads of State in Central Africa* in February 2005. MODIS data at 250-meter spatial resolution provided the basis for classifying the Congo Basin into forest, rural complex, wooded savanna, grassland, bare ground, and water categories.

ADDITIONAL ACTIVITIES

The Ecological Forecasting program element convened or participated in four workshops and major meetings in FY05:

- March 2005. *Coordinating Approaches for Utilizing Remote Sensing-Earth Observation (RS/EO) Data to Monitor and Report Landscape Dynamics in and Around Protected Areas*. NASA co-sponsored the workshop with the U.S. National Park Service, Parks Canada Agency, Canadian Space Agency, and Canada Centre for Remote Sensing.
- March/April 2005. *Ecological Modeling for NASA Applied Sciences*.
- May 2005. *IEOS Public Engagement Workshop*.
- August 2005. *Biodiversity and Ecological Forecasting Team Meeting*.

SOLICITATIONS

Decisions CAN

The Ecological Forecasting Program received 45 Step-1 proposals in the Decisions CAN and encouraged 28 to submit full proposals. In Step-2, the Ecological Forecasting program received 29 full proposals. Following the panel reviews and internal assessment for programmatic balance, the Applied Sciences Program selected two Ecological Forecasting proposals for awards:

Global Fire Information for Resource Management: Transitioning from a Research to an Operational System with an Emphasis on Protected Areas
PI: Diane Davies, University of Maryland-College Park

Integrating Earth Science Enterprise Results into Protected Area Decision Support for the Albertine Rift
PI: Nadine Laporte, Woods Hole Research Center

The Applied Sciences Program later selected additional proposals for one-year awards from a Congressionally-directed augmentation, including two projects for the Ecological Forecasting portfolio (the first is in conjunction with the Coastal Management program and the second with the Invasive Species program):

Predicting Right Whale Distributions from Space: An Operational System for Marine Ecosystem Modeling
PI: Andrew Pershing, Cornell University

Integration of a Large-area Invasive Spread Network (LISN) into the NISFS for Ecological Forecasting
PI: Robert Crabtree, Yellowstone Ecological Research Center

ROSES 2005 – Section A.24

For the Applied Sciences portion of the ROSES 2005 NRA, the Ecological Forecasting program element received 14 Step-1 proposals and encouraged 9 to submit full proposals. The Step-2 proposals were due in November 2005 with selections expected by April 2006.

PUBLICATIONS (SELECTED)

Jolly, W.M., R. Nemani, and S. Running, “A generalized, bioclimatic index to predict foliar phenology in response to climate,” *Global Change Biology*, vol. 11, pp. 619-632, 2005.

Melton, F., B. Lobitz, W. Turner, E. Sheffner, and J. Haynes, “Ecological modeling for applied science,” *EOS Transactions*, 86(35):319, 2005.

Steele, B., S. Reddy, and R. Nemani, “A regression strategy for analyzing environmental data generated by spatio-temporal processes,” *Ecological Modeling*, 181: 93-108, 2005.

Steininger, M., H. Strand, and E. Fosnight, “Remote Sensing and the Monitoring of Trends in the Extent of Selected Biomes, Ecosystems, and Habitats,” in *Working Together for Biodiversity: Regional and International Initiatives Contributing to Achieving and Measuring Progress Towards the 2010 Target*, CBD Technical Series No. 17, 2005.

Turner, W. and F. Melton, “Ecological Models and Satellite Imagery,” *ESA Bulletin*, 86(4):326-330, 2005.

White, M.A., F. Hoffman, W. Hargrove, and R. Nemani, “A global framework for monitoring phenological responses to climate change,” *Geophysical Research Letters*, Vol. 32, LXXXXX, doi:10.1029/2004GL021961, 2005.

Zhou, M., F. Heinsch, R. Nemani, and S. Running, “Improvements of MODIS gross and net primary production products and results from first 3-years,” *Remote Sensing of Environment*, 95 (2005) 164176.

CONFERENCE/WORKSHOP PRESENTATIONS (SELECTED)

Abrams, M, and GN Geller 2005. Increasing Access and Usability of Remote Sensing Data: The Protected Area Archive Tool Applied to UNESCO Heritage Conservation Sites. Paper presented at the *31st International Symposium on Remote Sensing of Environment*, 20-24 June, St Petersburg, Russia.

Crist, P 2005. Wildlife Conservation Planning at Differing Scales. Paper presented at the *Annual Meeting of the American Planning Association*, 19-23 March, San Francisco, CA.

Crist, P 2005. Software Tools For Mitigating Conservation Conflicts. Paper presented at the *Annual Meeting of the U.S. Institute for Environmental Conflict Resolution*, 24-26 May, Tucson, AZ.

Geller, GN 2005. Monitoring and managing with the NASA Protected Area Archive. Paper presented at the *19th Annual Meeting of the Society for Conservation Biology*, 15-19 July, 2005, Brasilia, Brazil.

Golden, K., Pang, W., “Dynamic Domains in Data Production Planning,” *Proceedings of the International Joint Conferences on Artificial Intelligence*, 31 July-5 August, 2005, Edinburgh, Scotland.

Melton, F., Nemani, R., Golden, K., Votava, P., Michaelis, A., White, M., Glymour, C., Myneni, R., Running, S., Coughlan, J., “Biospheric monitoring and ecological modeling for decision support,” *NASA Ecological Modeling Workshop Proceedings*, 29 March-1 April, 2005, Pacific Grove, CA.

Steininger, M and the NASA-NGO Group 2005. Remote Sensing and the Convention on Biological Diversity: Potential for integration into regular, global assessments. Paper presented at the *19th Annual Meeting of the Society for Conservation Biology*, 15-19 July, 2005, Brasilia, Brazil.

SERVIR-SPECIFIC PRESENTATIONS (SELECTED)

The Mesoamerican Visualization and Monitoring System: Coordinated Enhanced Observing Period (CEOP)/Integrated Global Water Cycle Observations (IGWCO) Joint Meeting. Tokyo, Japan. February 28th - March 4th, 2005.

Regional Visualization and Monitoring System (SERVIR) for Mesoamerica: A XXI Century Geospatial and Satellite Tool for Transboundary Watershed Management. Organization of American States (OAS) International Conference on Transboundary Watershed Management. Lima, Perú, May 2-5, 2005

SERVIR: A Model for GEOSS Implementation in the Americas. Earth Observation Partnership of the Americas (EOPA), Satellite Data Users Workshop. Buenos Aires, Argentina. June 2-3, 2005.

The Mesoamerican Visualization and Monitoring System: Regional Caribbean Symposium on Information Sharing In Climate Change and Development Issues. Belmopan, Belize. September 12-13, 2005.

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